The Effect of Transition Planning and Goal-Setting on College Enrollment Among Youth with Autism Spectrum Disorders

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Abstract

This study used propensity score techniques to assess the relationship between transition planning participation and goal-setting and college enrollment among youth with Autism Spectrum Disorders (ASDs). Using data from waves 1 through 5 of the National Longitudinal Transition Study-2, this study found that 2- or 4-year college enrollment rates were significantly higher among youth with ASDs who participated in transition planning and those who had a primary transition goal of college enrollment. Educational implications are discussed.

Keywords: transition planning, autism, college enrollment, propensity score weighting.

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The prevalence of autism spectrum disorders (ASDs) has steadily increased over the past few decades. Although estimates vary, recent studies cite prevalence rates between 20 and 100 cases per 10,000 (Matson & Kozlowski, 2011). Recent estimates indicate that 1 in 68 school-age children in the United States has an ASD (Centers for Disease Control and Prevention, 2014). Given their increasing numbers, it is critical that children and youth with ASDs are provided the services and supports that will promote positive post-high school outcomes, including employment and postsecondary education. Yet nationally, the combined 2-year and 4-year college enrollment rate for youth with ASDs was 32%, the third lowest among youth in 12 special education disability categories and much lower than that of youth in the general population (70%) (Shattuck et al., 2012; Wei, Yu, Shattuck, McCracken, & Blackorby, 2012).

This low rate of college participation has significant economic and personal costs for youth with ASDs, their families, and society. When multiplied by national high school graduation estimates (Hussar & Bailey, 2013), this prevalence rate suggests that approximately 49,000 youth with ASDs will graduate from high school in 2014-15. At current rates, almost 33,300 of them could fail to pursue any kind of postsecondary education in the first several years after leaving high school; fewer still are likely to pursue a college education rather than a vocational course of study (Newman, 2005). The U.S. Bureau of Labor Statistics reports that workers with a Bachelor's degree earn an average of $381 per week more than workers with some college experience but no degree or with no college education at all —a difference of almost $600,000 over a 30-year working life.

The high school years are the obvious time to intervene to improve college enrollment for youth with ASDs. However, little is known about the types of high school policies, interventions, and services that can increase enrollment rates and how high schools can use the transition planning process to do so. There is a growing need to identify evidence-based interventions in this field.

The History of Transition Planning

The evolution of federal special education legislation since the 1975 passage of the Education for All Handicapped Children Act (EHA, PL 94-142) has seen a steady strengthening of the intent that youth with disabilities meaningfully participate in planning their own post-high school transition and that their goals and interests guide the planning process. That landmark legislation made the individualized education program (IEP) and accompanying transition plan the cornerstones of special education needs identification, goal-setting, service and setting definition, and student assessment. EHA also specified that students could participate in their transition plan meetings, as appropriate (Gillespie & Turnbull, 1983).

With the 1997 reauthorization of what became the Individuals with Disabilities Education Act (IDEA), students ages 14 and older were to be not just allowed, but actively invited to attend their transition planning meetings, and all students were mandated to have a transition plan in place by age 16. Students' interests and preferences were to shape transition decisions, and their post-high school aspirations were to guide their high school course of study and transition services (Grigal, Test, Beattie, & Wood, 1997; Martin, Marshall, & Bale, 2004). The 2004 reauthorization of IDEA further refined the process for developing a transition plan and mandated that a student be invited to any IEP meeting that includes "consideration of postsecondary goals" (U.S. Department of Education, 2007).

Student Transition Planning Participation

Studies of students' educational goal-setting have focused largely on their participation in transition planning (Heatherington et al., 2010; Williams-Diehm, Wehmeyer, Palmer, Soukup, & Garner, 2008). Transition planning is an opportunity for students to learn and demonstrate self-determination skills, which are broadly conceived as "the ability to take primary control of one's own life and to do so in personally meaningful ways" (Schuler & Baldwin, 1981, p. 115) and are demonstrated in a process whereby students "make choices, act on those choices, experience the results, and then make new choices" (Agran & Hughes, 2008, p. 69).

Research suggests that students are increasingly attending IEP and transition planning meetings (Test et al., 2004), but they participate relatively little without direct instruction regarding the purposes and procedures of those meetings (Griffin, Taylor, Urbano, & Hodapp, 2014; Martin et al., 2006; Mason, McGahee-Kovac, Johnson, & Stillerman, 2002; Wehmeyer, Palmer, Soukup, Garner, & Lawrence, 2007). Nonetheless, reviews of research on transition-related best practices are united in asserting that student involvement is an important element of effective transition plans and programs (Greene, 2003; Hendricks & Wehman, 2009; Kohler, 1993; Landmark, Ju, & Zhang, 2010).

In analyses of data from a nationally representative study of students receiving special education services, students in the autism category reported high expectations for their own postsecondary education. Overall, 84.4% of students with autism reported that they "definitely" or "probably" would get some form of postsecondary education, and 61.7% and 54.2% reported that they "definitely" or "probably" would complete a 2-year or 4-year college degree, respectively (Wagner, Newman, Cameto, Levine, & Marder, 2007). Yet, only 22.9% of students with autism had a goal in their transition plan of attending a 2- or 4- year college (Cameto, Levine, & Wagner,

2004). This, coupled with evidence that students with autism are less likely to attend or to lead or actively participate in transition planning (Shogren & Plotner, 2012; Wagner, Newman, Cameto, Javitz, & Valdes, 2012), indicates a gap between students' personal expectations and plans laid out with the assistance of parents, educators, and other professionals.

Linking Student Transition Planning Participation, Postsecondary Goals, and Postsecondary Outcomes for Youth with ASDs

Existing research has illuminated factors that are positively associated with enrollment in postsecondary education among youth with ASDs, including greater functional independence, fewer limitations in functional areas (e.g., conversation, vision, and hearing) (Cameto, 2005; Carter, Austin, & Trainor, 2012; Newman, 2005), better high school academic performance (Chiang, Cheung, Hickson, Xiang, & Tsai, 2012; Shattuck et al., 2012; Taylor & Seltzer, 2011), higher income, non-Hispanic/non-African American racial/ethnic status (Chiang et al., 2012; Shattuck et al., 2012), and a longer time out of high school (Chiang et al., 2012; Shattuck et al., 2012). However, few studies have focused specifically on the connection between participation in transition planning and college enrollment or highlighted the ways in which transition goal-setting might affect college enrollment for youth with ASDs.

Studies investigating postsecondary participation in any field of study among students with ASDs have found that high school experiences play a significant role in a student's successful enrollment and participation in postsecondary education. Participation in transition planning during high school is associated with participation in postsecondary education for students with disabilities in general (Halpern, Yovanoff, Doren, & Benz, 1995) as well as students with ASDs (Chiang et al., 2012). Several studies have found that having strong self-determination skills, a characteristic that supports active transition planning participation, also is associated with

improved postsecondary outcomes for students with disabilities (Getzel & Thoma, 2008; Morningstar et al., 2010; Test, Mazzotti, Mustian, & Fowler, 2009).

Fundamental to transition planning is the responsibility to establish goals for a student's trajectory into his or her early post-high school years and to incorporate those goals into the transition plan and the activities that flow from it. To date, very few studies have linked goals with post-high school outcomes among individuals with ASDs. One correlational study found that a transition goal of pursuing postsecondary education increased the odds of enrollment by 330% (Chiang et al., 2012). The National Longitudinal Transition Study-2, the national data set used in this study, provides a unique opportunity to investigate the association between transition goals and attendance at postsecondary institutions for youth with ASDs. However, it is important to note that transition planning participation and the outcomes that result, including a student's transition goals, are influenced by a variety of factors (Wagner et al., 2012) that should be controlled for when examining the relationship between transition planning and postsecondary outcomes.

Study Purpose

Although there is existing research on student involvement in transition planning, studies of small, convenience samples predominate (e.g., Agran & Hughes, 2008; Fish, 2008; Landmark, Zhang, & Montoya, 2007; Spann, Kohler, & Soenksen, 2003), and even studies of larger samples have limited generalizability (e.g., Virginia Department of Education, 1998). Further, these studies are often descriptive and correlational in nature, and none used a quasi-experimental design to adjust for confounding. Additionally, there is almost no research linking transition goal-setting with post-high school outcomes except Chiang et al (2012). Because it is unethical in the context of an educational system to randomly assign students to participate in transition planning or to set a primary goal to enroll in college or not to do so, a larger-scale quasi-experimental study is

needed to explore the connection between transition planning, goal setting, and college enrollment. Findings will be useful for parents, advocates, and educators looking for ways to improve postsecondary outcomes for the growing ASD population.

We addressed this research need by focusing on two research questions and applying propensity score modeling methods to data from the National Longitudinal Transition Study-2. Specifically, our research questions examined whether the college enrollment rates for students with ASDs were associated with (1) their participation in transition planning and (2) having a primary transition goal of college enrollment specified in their transition plans.

Methods

Study Database

The National Longitudinal Transition Study-2 (NLTS2) is the largest, most comprehensive dataset available that generalizes to the experiences of youth with disabilities nationally as they transitioned out of high school. Conducted by SRI International for the U.S. Department of Education, data were collected from parents and/or youth in five waves, 2 years apart, from 2001 to 2009. The initial sample included more than 11,000 high school students who were ages 13 through 16 and receiving special education services on December 1, 2000, with about 1,100 of them receiving special education services in the autism category. Each student's eligibility for special education services was determined by the school district or special school from which the student roster was sampled (special schools are those serving only students with disabilities). It is important to note that the criteria for a special education determination of autism may differ from state to state and may differ from the criteria for ASD specified in the Diagnostic and Statistical Manual of Mental Disorders (Fourth Edition) (DSM-IV). However, more than 95% of children

with a school designation of autism also met DSM-IV-based case criteria in public health surveillance studies (Bertrand et al., 2001; Yeargin-Allsopp et al., 2003).

The NLTS2 two-stage sampling approach first randomly sampled local educational agencies (LEAs) and state-supported special schools stratified by region, district enrollment, and wealth. Students with IEPs for special education services were then randomly selected from rosters of LEAs or special schools and weighted to yield nationally representative estimates that generalize to all students in the NLTS2 age range receiving special education services and to those in each special education disability category (Wagner, Kutash, Duchnowski, & Epstein, 2005).

Participants

This paper includes data on a sample of approximately 920 youth with ASDs whose parents responded to a phone or mail survey at wave 1; approximately 660 of them remained in the study at wave 5. The study used data from parent/youth telephone surveys or mail questionnaires across all five waves as well as students' high school transcripts and responses to surveys of school staff who were familiar with youths' high school programs. The estimates reported here used cross-wave weights that were suitable for analyzing multiple waves of NLTS2 data (Valdes et al., 2013). Unweighted sample sizes were rounded to the nearest 10, as required by the U.S. Department of Education.

Intervention Variables

The intervention variables were extracted from Student's School Program Survey items relating to transition planning at wave 1 in 2002 for older high school students and at wave 1or wave 2 in 2004 for younger high school students.

Transition planning participation. Transition planning participation was coded 1 if a student was reported by a school staff member who was familiar with his/her school program to

have "provided some input into transition planning as a moderately active participant" or "taken a leadership role in the transition planning process, helping set the direction of discussion, goals, and programs or service needs identified." Participation was coded 0 if a student had "not attended planning meetings or participated in the transition planning process" or had been "present in discussions of transition planning but participated very little or not at all."

Had a primary goal of college enrollment in their transition plan. The Student's School Program Survey asked respondents to identify "the primary goal of this student's educational program" and provided eight structured responses, including attending a 2- or 4-year college; attending a postsecondary vocational training program; finding competitive, sheltered, or supported employment; living independently; maximizing functional independence; and enhancing social/interpersonal relationships and satisfaction. Typically, more than one primary goal was indicated. If the goals included attending a 2- or 4-year college, this variable was coded 1; otherwise, it was coded 0.

Outcomes

College enrollment. We identified whether youth with ASDs were ever enrolled in college by examining parents and/or youth's answers to two survey items at waves 2 through 5 for youth who were out of high school at those waves: whether the youth had ever since leaving high school attended (1) a 2-year or community college or (2) a 4-year college or university. A measure of any 2-year or 4-year college enrollment was coded 1 if either of the survey items was yes in any wave and 0 if both items were no in all waves. All outcome variables were measured after the intervention variables. Specifically, older high school students whose transition planning activities were measured at wave 1 were out of high school by wave 2 and reported their college enrollment status at wave 2. Younger high school students whose transition planning activities were

measured at wave 2 were out of high school at waves 3 or later and reported their college enrollment status as early as wave 3.

Covariates

An important aspect of estimating the propensity score in propensity score modeling is the selection of covariates. Researchers suggest that covariates that affect both intervention participation and outcomes should be included in the estimation of the propensity score (Caliendo & Kopeinig, 2008; Heckman, Ichimura, Smith, & Todd, 1998; Lechner, 2002; Ravallion, 2001). Covariates included in this study were derived from correlates of college enrollment and transition planning participation that have been cited in the literature described above: youth's gender, age, race/ethnicity, disability severity, high school achievement, family income, mother's education level, whether or not parents ever enrolled in a postsecondary school/program, and parents' expectation of youth attending college.

Covariates were measured in the wave 1 Parent Phone Interview and/or Mail Survey in 2001; thus, measurement of all covariates preceded the interventions. Five factors were used to assess disability severity: the presence of Attention Deficit/Hyperactivity Disorder (ADD/ADHD) and measures of youth's social skills, conversational ability, self-care skills, and functional cognitive skills. For ADD/ADHD, parents reported whether or not youth had the disorder. Youth's social skills were measured by summing the responses to 11 questions from the Social Skills Rating Systems (SSRS) parent version (Gresham & Elliott, 1990), which asked parents to rate how often (1=never, 2=sometimes, 3=very often) their child was able to do the following: join groups, make friends, end disagreements calmly, seem confident in social settings, avoid trouble, start conversations, receive criticism well, control temper when arguing, keep working until finished, speak in an appropriate tone, and cooperate with family members. The social skills score

ranged from 11 to 33, with a reliability of alpha=0.79. Parents rated children's conversational ability as 1=doesn't converse at all, 2=has a lot of trouble conversing, 3=has a little trouble conversing, or 4=converses as well as other children his/her age. Self-care skills were measured by a summing scores ranging from 1 (low) to 4 (high) on items indicating how well youth could dress and feed themselves independently. Functional cognitive skills were measured using a scale from 4 (low) to 16 (high) based on parents' reports of how well their children were able to do the following four tasks without help: tell time on an analog clock, read and understand common signs, count change, and look up telephone numbers and use a telephone. Each item had four response categories: 1=not at all well, 2=not very well, 3=pretty well, 4=very well. A summation of the scores on the four items measures students' overall cognitive functioning, with internal consistency reliability of 0.93.

Youths' academic achievement was measured by their high school grade point average (GPA), measured in Carnegie units and extracted from their high school transcripts. One Carnegie unit is associated with a student passing a course that meets for approximately 1 hour per day, 5 days per week for a total of 24 weeks. We also calculated a dichotomous variable coded 1 for students who were able to take standardized achievement assessments at either wave 1 or 2. For the remaining youth, for whom an alternative assessment was completed by an adult familiar with the student due to a student's physical, cognitive, or behavioral limitations, the item was coded 0.

Propensity Score Methodology

Propensity score methods are quasi-experimental approaches that were developed to approximate findings obtained from randomized control trials (RCTs) (Becker & Ichino, 2002). They have been increasingly used in analysis of observational data to reduce selection bias in estimating treatment, policy, or intervention effects when RCTs are not feasible or ethical.

Propensity score methods enable quasi-experimental contrasts between students experiencing naturally occurring treatments and comparison groups whose members are similar on other factors included as covariates in the models. This study used propensity score methods to test the effect of particular aspects of a special education policy—transition planning and goal setting—on college enrollment rates. The propensity score is the predicted probability of participating in an intervention based on a set of potentially confounding covariates (e.g., student demographic and disability characteristics, student academic achievement, parents' expectations of students attending college) using logistic regression. Propensity scoring attempts to equalize the mean values of potentially confounding covariates in the treatment and comparison groups, and assures that differences in outcomes are not the result of differences in mean values on those covariates. Although it aims to generate rigorous and unbiased estimates of the effects of a treatment on the outcome of interest, propensity scoring cannot account for unobserved confounders and requires a sufficiently large sample that has overlap between treatment and comparison groups.

Two types of analyses to estimate the average treatment effect on the treated (ATT) were conducted. One analysis estimated the ATT on the treated students in the sample (SATT). The other analysis estimated the ATT on treated students in the population (PATT) represented by NLTS2 students with ASDs.

Analyses of SATT adjusted for confounding using an inverse propensity score estimator, as recommended by Curtis, Hammill, Eisenstein, Kramer, and Anstrom (2007); Hirano, Imbens, and Ridder (2003), and Rosenbaum and Rubin (1983). Specifically, the weight for treated students was their survey weight (or in the case where the intent is not to project to a population, the weight is 1.0), and the weight for comparison students was equal to their survey weight multiplied by $(p_i/1\text{-}p_i)$, where p_i is the propensity score for the i-th comparison student (Harder, Stuart, &

Anthony, 2010; Hirano et al., 2003). Analyses of PATT adjusted for confounding using the approach recommended by DuGoff, Schuler, and Stuart (in press). The weight for treated students was their survey weight, and the weight for comparison students was equal to their survey weight times their propensity score transformed to an odds scale (DuGoff et al., in press).

The SATT and PATT of transition planning participation and transition goal-setting were estimated using a weighted logistic regression model. The odds ratio (OR) from each model can be interpreted as the measure of association between transition planning participation or goal-setting and college enrollment rates, adjusted for the estimated propensity of participation or having a college enrollment transition goal. This essentially weights the comparison group to create balance with the treatment group on observed covariates and thus estimates the effect of the two interventions for the individuals who actually participated in them. Weighting was selected over other approaches, such as matching, because of its good performance in this dataset (details below), flexibility with the distribution of the data, capability to deal with time-dependent covariates and censored data, and because it retains all subjects in the analysis. After propensity score weighting for comparison students, we examined the standardized mean score (the difference in means for the treatment and comparison groups, divided by a pooled standard deviation) to assure that they were less than 0.25, a standard recommended by the Institute of Education Science's What Works Clearing House (Institute of Education Sciences, 2014), thereby demonstrating covariate balance.

Handling of Missing Data

Missingness rates for covariates ranged from no missing to 52%. Missing data on covariates were imputed 20 times using Stata's ICE (Imputation by Chained Equations) procedure (Royston, 2004, 2005, 2007, 2009; Royston, Carlin, & White, 2009; White, Royston, & Wood,

2011). Imputations were performed on all variables used in the analyses to avoid bias associated with listwise deletion and to capture the information contained in the correlation between covariates and the outcome and treatment variables. However, we did not use imputed values for the outcomes or treatments in the analyses, as recommended by Little (1992), Little and Rubin (2002), White et al. (2011), and Von Hippel (2007). Analyses conducted on imputed data were aggregated using the Stata mim procedure, a command for analyzing multiply imputed datasets that combines regression results across imputations and adjusts the standard error estimates to accurately reflect the uncertainty due to missingness.

Results

Table 1 shows the characteristics of youth with ASDs weighted to represent the population. Consistent with epidemiological estimates, 85.41% of youth were male. The sample was diverse in terms of ethnicity, race, and family socioeconomic position. Pertinent to the study's outcome of interest, parents of more than 7 in 10 youth reported having themselves enrolled in some form of postsecondary education, and more than one-third definitely or probably thought their student would also. Functionally, 54.91% were reported to have either a lot of trouble or no ability to converse, and 56.07% were not able to participate in the direct assessment of their academic skills, emphasizing that this was not a predominantly high-functioning group of youth with ASDs. Four in 10 youth participated in transition planning and about one-fourth had a primary transition goal of college enrollment in their transition plan. Overall, three in 10 attended a 2- or 4-year college after high school.

<Table 1>

To ensure that the propensity score method successfully created balanced treatment and comparison groups, we compared the standardized mean differences between the two groups for

each covariate before and after propensity score weighting for both SATT and PATT. The balance on the covariates in the analysis was greatly improved after applying the propensity score weighting method for both SATT and PATT. Due to space limitations, data presented in Table 2 show the balance for SATT. Before propensity score weighting, the differences on covariates in the two models ranged from -0.48 to 1.63 standard deviations; whereas after propensity score weighting, the average differences on covariates ranged from -0.14 to 0.23 standard deviations. For example, before propensity score weighting, students with ASDs who participated in transition planning were less likely to be African-American (column B = - 0.33), less likely to come from low-income families (- 0.28), and more likely to have taken the direct assessment (0.64) than their peers who did not participate in the transition planning. Students with ASDs who participated in transition planning also had higher cognitive functioning skills (1.11), conversation ability (0.86), self-care skills (0.45), and parental expectation of youth attending college (0.87) than their peers who did not participate in transition planning. After propensity score weighting, the difference between students who participated in transition planning and those who did not was reduced to -0.10 to 0.08 (column C) standard deviations on all baseline covariates. Following the same pattern, students with ASDs who had a primary transition goal of college enrollment also had a higher likelihood of being included in the direct assessment (column E = 0.77), had higher cognitive functioning skills (1.52), higher social skills (0.44), higher conversation ability (0.84), and higher parent expectations of youth attending college (1.63). By conducting propensity score weighting, these large differences were reduced to - 0.14 to 0.23 (column F) standard deviations across the covariates. Therefore, after propensity score weighting, participants and nonparticipants were very similar on all potentially confounding covariates that were included in the analyses.

<Table 2 >

The unadjusted 2- or 4-year college enrollment rates differed significantly in both the sample and population estimates between transition planning participants and nonparticipants and between those who had a college enrollment goal in their transition plans and those who did not have such a goal (comparing "Treatment" column and "Comparison" columns in Table 3). However, the last column in Table 3 shows that when models were weighted, transition planning participants had significantly higher odds of attending a 2- or 4-year college than nonparticipants in the sample estimates but not in the population estimates[1]. Youth who had a primary transition goal of college enrollment had significantly higher odds of attending 2- or 4-year college than those who did not have such a goal in both the sample and population estimates.

<Table 3>

Discussion

These results provide a national picture of the effect of high school transition planning participation and goal-setting on college enrollment rates among students with ASDs. About 40.29% of youth with ASDs actively participated in their transition planning meetings, and 24.20% had a primary transition goal of college enrollment in their transition plan. We found that both transition planning participation and having a primary transition goal of college enrollment during secondary school were associated with higher odds of attending a 2- or 4-year college among the sample of youth with ASDs. Findings related to having a primary transition goal of college enrollment also generalize to the population. These findings add empirical evidence to the literature (Greene, 2003; Hendricks & Wehman, 2009; Kohler, 1993; Landmark et al., 2010) on

[1] It is likely that there are differential treatment effects across different subgroups of ASD. When the treatment effect was weighted to the population, the ATT population estimates are different from the ATT sample estimates.

the benefits of student involvement in transition planning and goal-setting for students receiving special education services.

Transition planning begun early in high school provides the context within which students with disabilities can articulate their post-high school goals and work with parents, school staff, and others to chart a course toward them. The transition plan itself is required by law to specify the transition services needed to assist students in achieving their goals (IDEA Partnership, 2004). This study suggests that participation in transition planning is a valuable opportunity to intervene to improve postsecondary education outcomes for secondary school students with ASDs. However, there is a marked contrast between the large percentage of youth with ASDs who expect to attend a postsecondary institution (84.40%) and the low percentage who have postsecondary education goals included in the transition plan (24.20%) (Bhandari & Wagner, 2006; Wagner et al., 2007). This emphasizes the urgent need to effectively engage youth in the transition planning process so that their interests and desires are reflected in their plans. This study finds that specifying a primary goal related to college attendance in transition plans also can effectively boost the odds of attending college by 564% (OR=6.64, 95% CI:1.89–29.16) for youth with ASDs in the population as shown in Table 3.

Postsecondary education benefits youth with disabilities by increasing their potential to become self-reliant, tax-paying, and civically engaged citizens. Over the last decade, there has been an expansion of opportunities in higher education for individuals with disabilities and of their full inclusion in the college classroom. There are reports that as many as 200 college and university programs across the country actively support students with disabilities in their academic programs, career development, and campus life (Blalock, 2014; Grigal & Hart, 2010). One of the founding concepts of "inclusive postsecondary education" is to embed individuals with

disabilities, particularly those with intellectual disabilities, within normative pathways to the maximum extent possible (Uditsky & Hughson, 2012). Similar to students without disabilities, educators should explore college as a viable option with youth and parents and begin to prepare students with ASDs for college at the start of the transition planning process. Based on a partnership between educators and a youth's family, student-focused planning should enable student participation in decision making and goal setting, particularly if the student expresses goals related to postsecondary education. The process should support high school coursework based on students' goals and interests, self-evaluation of their progress in meeting their goals, and development of self-determination and other skills to achieve goals (Kohler, 1993, 1996, 1998; Kohler & Field, 2003).

Although it makes a valuable contribution to the transition planning literature for youth with ASDs, this study has several limitations. First, unobserved confounding is a concern in propensity score modeling. There is a possibility that an unmeasured factor might be correlated with both the likelihood of transition planning participation and goal-setting and the likelihood of college enrollment. Second, the college enrollment data were collected via surveys, not college registration records, which may result in reporting biases. Future research could validate the results of this study by using other data sources, such as enrollment data from a university disability support office. Third, future studies should test the mechanism underlying the positive association between transition planning and goal-setting and college enrollment. For example, it is possible that improved self-determination skills, more academically oriented secondary school course-taking patterns, or the interplay of the two may mediate the relationship between transition planning and goal-setting and college enrollment. Finally, NLTS2 surveyed youth's expectations of attending college as well as parents'. However, this variable was collected at wave 2 and our

analysis only included covariates from wave 1. In addition, only youth who were able to respond to an interview or complete a survey and those who were not attending or who had not previously attended a postsecondary education institution were asked this question; therefore, it has extensive missing data (57.38%). Thus, this variable could not be included as a covariate in the analyses, although it has been reported previously for descriptive purposes only in Wagner et al. (2007).

Despite these limitations, this study breaks new ground in the understanding of best practices in transition planning for youth with ASDs. The national sampling frame and the large size and diversity of the study sample increases the external validity of the findings. The use of propensity score methods is innovative and strengthens the case for the effect of transition planning participation and goal-setting on college enrollment. The extensive list of covariates included in both the propensity score weighting procedure and ATT estimation not only ensures the participants and non-participants were similar on all included factors, but also makes the estimation of the ATT effect of transition planning participation and goal-setting more robust. Lastly, the measures of transition planning participation and goal-setting were based on school records, which are more reliable than parent- or student-reported transition planning participation rates.

In sum, the findings from this study lay the groundwork for better understanding the association between transition planning practice and goal-setting and college enrollment among youth with ASDs. This study empowers all parties (e.g., policymakers, students, parents, teachers, etc.) who strive to expand postsecondary education opportunities for youth with disabilities to start the secondary school transition planning process as early as possible so that students' course taking and other high school experiences can be aligned with and support achievement of transition goals. To increase college enrollment rates and the benefits of a college education for

youth with ASDs, high school personnel can ensure that youth with ASDs are given the training and supports needed to participate actively in their own transition planning and explore whether postsecondary education goals can be set and met in their transition planning process. Future studies in the area of ASD and postsecondary education should continue identifying evidence-based practices and interventions that increase the likelihood of postsecondary participation among the growing population of young adults with ASDs and extend the analyses to address college completion, through which the benefits of postsecondary education can be realized.

Table 1. Descriptive Analysis of Youth with ASDs

Variables Used in this Study	Full Sample		
	Weighted Percent or Mean	*s.e.*	Unweighted *n*
Covariates			
Male, %	85.41	2.00	960
African American, %	21.84	0.98	920
Hispanic, %	10.20	0.85	920
Age[a], %			
13	7.44	1.53	960
14	27.76	3.00	960
15	23.07	2.49	960
16	25.44	2.83	960
17	16.31	2.13	960
Income, %			
Low: ≤US $25,000	24.93	0.86	830
Medium: US $25,001 - US $ 50,000	29.11	1.04	830
High: > US $50,000	45.96	0.84	830
Mother's education level, %			
Less than high school	8.04	1.26	850
High school graduate or GED	25.33	2.62	850
Some college	34.32	3.05	850
B.A. or higher degree	32.32	2.74	850
Parent ever attended postsecondary education	71.41	2.28	880
Parent expectation of youth going to college, %			
Definitely will not	36.63	2.81	870
Probably will not	25.99	2.27	870
Probably will	23.19	2.38	870
Definitely will	14.19	1.56	870
Has ADD/ADHD	18.77	2.52	740
Mean social skills scale score	11.37	0.15	860
Mean cognitive functioning skills	10.94	0.24	910
Conversation ability, %			
Does not carry on a conversation at all	18.10	2.30	890
Has a lot of trouble carrying on a conversation	36.81	2.86	890
Has a little trouble carrying on a conversation	30.62	3.14	890
Converses as well as other children	14.47	1.91	890
Had a direct assessment score, %	43.93	3.16	960
Mean self-care skills scale score	6.97	0.08	910
Mean high school GPA	3.03	0.07	460
Intervention			
Transition planning participation, %	40.29	2.67	630
Had a primary transition goal in college education,	24.20	2.90	700

%			
Outcomes			
Attended any 2- or 4-year college since high school, %	29.63	2.63	710

Note: ASDs = Autism Spectrum Disorders; GED= general education development; ADD/ADHD = Attention Deficit/Hyperactivity Disorder; GPA = grade point average.
[a] Age as of July 15, 2001
Source: NLTS2, waves 1 through 5. Percentages were weighted to population levels. Unweighted Ns were rounded to the nearest 10.

Table 2

Treatment and Control Balance Statistics on Covariates after Propensity Score Weighting for ATT Students in the Sample

	Column					
	A	B	C	D	E	F
Covariates	Transition planning participation			Had a primary transition goal in college education		
	Treatment	Pre-PSW Balance	Post-PSW Balance	Treatment	Pre-PSW Balance	Post-PSW Balance
Male, %	85.10	0.06	-0.04	87.29	0.15	-0.13
African American, %	17.70	-0.33	-0.001	15.18	-0.34	0.04
Hispanic, %	5.84	-0.22	0.03	2.41	-0.35	-0.02
Age	14.90	-0.14	0.03	14.90	-0.11	0.23
Income low, %	14.37	-0.28	-0.02	12.01	-0.48	0.04
Income medium, %	30.45	0.03	-0.002	29.53	0.02	0.02
Mother's education level	2.99	0.13	-0.07	3.26	0.53	-0.02
Parent ever attended postsecondary education, %	77.39	0.17	-0.09	88.70	0.52	0.04
Parent expectation of youth attending postsecondary education	1.74	0.87	-0.03	3.24	1.63	-0.004
Has ADD/ADHD, %	17.72	-0.04	-0.10	17.50	-0.02	0.03
Social skills scale score	12.16	0.32	0.08	12.61	0.44	-0.13
Cognitive functioning skills	12.89	1.11	-0.09	14.24	1.52	0.03
Conversation ability	1.85	0.86	-0.07	1.96	0.84	-0.14
Had a direct assessment score, %	67.49	0.64	0.01	76.40	0.77	0.22
Self-care skills	7.41	0.45	-0.04	7.55	0.52	-0.02
High school GPA	3.04	0.00	0.03	2.97	-0.20	0.03

Note: ATT= average treatment effect on the treated; ADD/ADHD = Attention Deficit/Hyperactivity Disorder; GPA = grade point average. PSW=propensity score weighting.

Source: NLTS2, waves 1 through 5. Balance statistics is measured by the standardized mean difference, which is the difference in means between the groups, divided by the pooled standard deviation of both the treatment and comparison group.

Treatment and control balance statistics on covariates after propensity score weighted for ATT students in the population were similar to the balance statistics for ATT students in the sample. Due to space limitation, they are not presented here.

Table 3

ATT Effect of Transition Planning Participation on College Enrollment Rates for Youth with ASDs

Intervention	ATT estimates	Any 2- or 4- year college enrollment rates			
		Treatment[a]	Comparison[b]	Propensity Weighted Comparison[c]	Propensity Adjusted OR [95% CI] [d]
Transition planning participation	Sample	54.08%	17.03%***	37.65%*	1.95* [1.10, 3.45]
	Population	50.28%	18.83%***	34.98%	1.88 [0.81, 4.33]
Had a primary transition goal in college education	Sample	76.09%	14.49%***	41.80%**	4.43** [1.51, 13.00]
	Population	80.02%	12.09%***	37.62%**	6.64** [1.89, 29.16]

* $p < .05$, ** $p < .01$, *** $p < .001$

Note: ATT= average treatment effect on the treated; ASD=Autism Spectrum Disorder; OR = odds ratio; CI=confidence interval; LOR=logged odds ratio

[a]Treatment column indicates treatment group percentages rates

[b]Comparison column indicates the control group percentage. The treatment-comparison differences in college enrollment rates were tested by weighted chi-square tests.

[c]Propensity weighted comparison is the estimated propensity of the comparison group enrolling in college based on the weighted logistics regression model controlling for demographic, disability, academic, and parent expectation. It is calculated as 100 * Pt / [OR (1-Pt) + Pt] where Pt is the treatment group college enrollment rates and OR is the propensity adjusted OR. The significance level indicates whether treatment and comparison group are significantly different in the weighted logistic regression model.

[d]Propensity adjusted OR controlled for demographic, disability, academic achievement, and parent expectation covariates in the weighted logistic regression model. The significance level indicates whether treatment and comparison group are significantly different in the weighted logistic regression model. Effect size for the odds ratios (*OR*s) can be calculated using the Cox Index $LOR_{Cox} = \ln(OR)/1.65$ (Cox, 1970).

Source: NLTS2, waves 1 through 5.

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